Cost-effectiveness of a diabetes group education programme delivered by health promoters with a guiding style in underserved communities in Cape Town, South Africa

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Submitted in partial fulfilment of the MMed degree.

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Declaration

I, the undersigned, hereby declare that the work contained in this assignment is my original work and that I have not previously submitted it, in its entirety or in part, at any university for a degree. I also declare that ethical approval for the study was obtained from the Health Research Ethics Committee of Stellenbosch University (Reference number: N11/07/235).

Signature:  Date: 16/09/2013

Abstract

Background

Resource constrained primary care environments in Africa need cost-effective models of patient education to combat the emerging epidemic of non-communicable chronic diseases. This study aimed to evaluate the cost-effectiveness of a group diabetes education programme delivered by health promoters with a guiding style,in community health centres in the Western Cape, South Africa.

Method

The effectiveness of the education programme was derived from the outcomes of a pragmatic cluster randomised controlled trial (RCT). Incremental operational costs of the intervention, as implemented in the trial, were calculated. All these data were entered into a Markov micro-simulation model to model outcomes and cost-effectiveness expressed as an Incremental Cost Effectiveness Ratio (ICER).Data predicting risk of death from stroke and ischaemic heart disease in this model was derived from South African surveys.

Results:

The only significant effect from the RCT was a reduction in blood pressure at 1-year (systolic blood pressure -4.65mmHg (-9.18- -0.12) and diastolic blood pressure -3.30mmHg (-5.35 - -1.26)). The ICER for the intervention, based on the assumption that the costs would recur every year and the effect be maintained, was 1862.

Conclusion:

An ICER of less than 10000 for medical intervention in South Africa is considered cost-effective. A structured group education programme performed by mid-level trained healthcare workers with a guiding style at community health clinics, for the management of Type 2 diabetes in the Western Cape, South Africa is therefore cost-effective.

Introduction

The burden of non-communicable chronic diseases is high in low and middle-income countries and is predicted to increase with the aging of populations, urbanisation and globalisation of risk factors.[1]Diabetes is an important disease because it contributes significantly to this burden of non-communicable chronic disease.[2]South Africa has a large number of people living with diabetes and this number is predicted to increase substantially over the next few years.[1]The prevalence rate of diabetes in parts of Cape Town has been reported to be as high as 33%, although self-reported prevalence rates for diabetes in South Africa have been reported at 2.4% in men and 3,7% in women.[1]In 2000 the adult mortality associated with diabetes was about 4.3% of deaths in South Africans over the age of 30.[3]In South Africa diabetes often affects working age people, as well as the elderly, and therefore can also have significant economic consequences.[4]In 2011 the prevalence of diabetes in South Africa was estimated to be 6.5% in the age group 20-79years.[5]

Effective management of diabetes requires medication as well as self-care and lifestyle change from the patient. A holistic and integrated approach to the management of chronic diseases is needed in primary health care. To meet the challenges of diabetes in primary health care, we will have to strengthen both pharmacological and psychosocial interventions, as well as long term follow up with regular monitoring and promotion of adherence to treatment.[6]

Poor diabetes management is associated with deficiencies in knowledge and selfcare.[1]Behaviour change counselling to promote self-care and lifestyle change has not been done well in our setting for various reasons. Some of these reasons include a lack of counselling space, lack of support, lack of knowledge, poor counselling skills, time pressure and patient's perceived resistance to change as a result ofcounselling.[22] The majority of people with diabetes are looked after by nurses in the public sector at health centres and clinics.[6] In the Western Cape although the technical quality of care has been improving, there is still little attention given to a structured and comprehensive education programme that will work in our context.

Patients have a right to understand their diagnosis and how to manage their condition and health services should provide health education and counselling. However in a climate of scarce resources, policy-makers need to know which interventions represent value for money.[8]The development of appropriate models of behaviour change counselling in our context that can be scaled up will depend on their cost-effectiveness.

The incremental cost-effectiveness ratio (ICER) is the gold standard for comparing different treatment interventions by analysing cost and benefit. No cost-effectiveness studies regarding behaviour change counselling in diabetes have been performed in South Africa. Systematic reviews by the American Diabetes Association(ADA) found that lifestyle interventions for the prevention and management of diabetes mellitus, cardiovascular disease and other chronic diseases were cost-effective.[8,9,10,11]

In low resource settings group approaches to patient education may make sense, given the large number of patients with diabetes and the relatively low number of health workers. A systematic review of group diabetes education suggests that it can be effective at improving glycaemic control, improving blood pressure, helping with weight loss and reducing the need for medication.[15] The studies in this review, however, were from high income settings and mostly used expensive health workers such as dieticians. In a recent local study, from the Eden District in the Western Cape, group diabetes education was shown to lead to significant improvement in self-care activity in the form of adherence to diabetes diet, physical activity, foot care and the perceived ability to teach others. These results were obtained through measuring the effect on self-care activities, immediately before and after education.[7] A pragmatic cluster randomised control trial(RCT) that evaluated group education of diabetes by health promoters with a guiding style (derived from motivational interviewing) was also recently completed in the public sector primary care services in Cape Town. Implementation of the model of diabetes group education from this RCT will depend on how effective it is and the costs involved in rolling it out. The RCT measured effectiveness and this study will measure the costs involved and analyse the cost effectiveness using the ICER. As health care costs have continued to rise, many new clinical trials are attempting to integrate ICER into results to provide more evidence of potential benefit.[12]

Several studies have also been completed on different forms of motivational interviewing(MI) in the prevention and management of type 2 diabetic mellitus patients in European and American settings.[9,10,14,15,16]Many of these include measures of cost effectiveness.[4,9,13] They report mixed findings with regards to motivational interviewing(MI). It can be used as an effective way of enhancing diabetes treatment, but is more effective when targeted to a specific behaviour.[14]The majority of the studies found positive results for the effects of MI on psychological, physiological, and lifestyle change outcomes.[14,15,16]In 2009 four meta-analyses on the effectiveness and application of motivational interviewing found MI is 10-20% significantly more effective than no treatment and generally equal to other available therapies (such as

cognitive behavioural therapy). Its application ranges from a variety of problems such as substance use(alcohol, marijuana, tobacco and other drugs) to reducing risky behaviours in chronic disease and increasing client engagement in treatment.[17]None of these studies reported on the cost-effectiveness of group motivational interviewing performed by midlevel health care workers. Indeed, no trials of group behaviour change counselling for diabetes by mid-level workers has previously been reported in our setting – a middle income African country.[18]

Aims and objectives

The aim of the study was to determine the cost-effectiveness of a group education programme delivered by health promoters with a guiding style in community health centres in Cape Town. Specific objectives were to:

Objective 1: Evaluate the start-up costs of the programme

Objective 2: Evaluate the operational costs of running the programme

Objective 3: Compare costs to the measured effectiveness of the programme derived from the larger RCT and report on the ICER

Objective 4: To make recommendations to the Department of Health on the cost effectiveness of the programme

Methods

Study design

This was a cost-effectiveness study utilising the ICER as an outcome measure.

Overview of the randomised control trial

The design of the pragmatic clustered RCT has been published fully elsewhere.[14]There were 17 randomly selected intervention and 17 control sites, with 860 patients with type 2 diabetes in the control and 710 in the intervention sites. The control sites offered usual care, while the intervention sites offered 4 sessions of group diabetes education, a month apart, delivered by a health promoter (mid-level health worker). "Health promoters recruited from the district health services were trained over a total of 6 days to deliver each session within the facility, using a guiding style of communication based on motivational interviewing principles and skills. Resource materials for group activities were developed for each session and the training manual was published. Where necessary resource materials were made available in English, Afrikaans and Xhosa."[12] It included leaflets and information

sheets on foot care, goal setting, alcohol use and smoke cessation that were supplied by each HPO for the patients to take home. The intervention consisted of four 60 minute sessions. These group education sessions focused on understanding diabetes, living a healthy lifestyle, understanding the medication and avoiding complications.12Participants were measured at baseline and at 12 months. Primary outcomes included diabetes self-care activities, 5% weight loss, and HbA1c reduction of 1%. Secondary outcomes included self-efficacy, locus of control, mean blood pressure, mean weight loss, mean waist circumference, mean HbA1c, mean total cholesterol and quality of life. The setting of the study was community health centres in the Cape Town Metropolitan area that serve the uninsured majority population within the public sector. The only significant effect from the RCT was a reduction in blood pressure at 1-year (systolic blood pressure -4.65mmHg (-9.18- -0.12)and diastolic blood pressure -3.3mmHg(-5.35 - -1.26)).

Data collection

To ensure that the costs were fully understood I conducted interviews with key informants at the University and within the Metropolitan District Health Services. Key informants were purposefully selected for their knowledge of the costs involved and the financial systems of the district health services. The following people were consulted: study investigators, health promoters, facility managers, district level financial officers and managers. These interviews were used to check that the researchers had correctly identified all the costs that would be involved in implementing the educational programme. These interviews were not regarded as qualitative data and no formal analysis was performed.

Data was then collected from the financial records of the RCT within the Division of Family Medicine and Primary Care, Stellenbosch University. Costs related to the research study and which would not be part of implementing the educational programme in normal service delivery were excluded. Only incremental costs that would add additional costs to what is already being paid for by the health services were considered.

Data analysis

All numerical data were checked and captured on an Excel spreadsheet. Data on the patients and the outcome measures were made available by the principal investigator from the RCT. Data on cost was then entered into a cost-effectiveness model for cardiovascular disease that had been created by Prof Tom Gaziano at Harvard University in collaboration with the Chronic Disease Initiative for Africa (CDIA) in Cape Town.

Research by the CDIA is currently underway to assess the economic impact of prevention and management interventions for chronic diseases. The aim is to develop a Cardiovascular Disease (CVD) prevention and management model that will allow the prediction of CVD events and which could be used in cost-effectiveness analyses of screening and intervention studies. State-transition simulation models have been developed to assess the cost-effectiveness of interventions. [23] The model evaluates the Incremental Cost Effectiveness Ratio and cost per Quality Adjusted Life Years (QALY) saved. The incremental cost-effectiveness ratio (ICER) is commonly used in health economics to provide a practical approach to decision making regarding health interventions. It is specifically used in cost-effectiveness analysis and is the ratio of the incremental increase in costs, measured in US$, to the benefits of a therapeutic intervention, measured in QALYs saved. By using this ratio, comparison can be made between treatment modalities to determine which provides a more cost-effective treatment.[19]

The cost-effectiveness model developed by Harvard University is based on the Markov micro-simulation model, which is particularly suited to modeling chronic disease, and is used for economic evaluation of healthcare interventions. Markov models have been used for several years to support health service decision-making. Its primary use is in economic-evaluation, but it can also be applied epidemiologically. One of the strengths of Markov modelling is that it can handle both costs and outcomes simultaneously. It is well suited for modeling disease progression over time.[20] In our study the analysis modeled the outcomes of a clinical trial to project the longer-term cost-effectiveness of interventions from a payer perspective.[13]

The model incorporates all basic CVD risk factors (age, sex, smoking, diabetes mellitis (DM), blood pressure (BP), cholesterol or body mass index (BMI) if cholesterol is not available) and predicts future rates of angina, myocardial infarction, or stroke and death for any population. Data was used from the initial RCT to explore predicted changes in future CVD events based on the effect shown by the RCT. The cost of achieving a reduction in risk factors (in this case BP) and the likely long term benefit of this in terms of avoiding future deaths from CVD events can then be modeled.

The baseline data from the RCT, which measured the risk factor profile of the study population, was used to generate a theoretical population of 1000 000 people with diabetes in the model. The incremental costs of implementing the intervention over a

1-year period were also entered into the model. The theoretical population was created to share the same risk factor profile as the study population. The model was then used to predict future mortality from CVD events over 10-years, 30-years and eventually until they die. The model could also compute future costs related to the intervention and to the treatment of CVD events. The model was then able to compare the results for a population with no intervention vs. a population with the intervention from the RCT that had the decreased BP. From this comparison the model was able to determine the incremental costs and the QALYs saved (utility)and to calculate the ICER.

Since the trial only lasted one year, we ran four different scenarios for what might happen in subsequent years and calculated results for each scenario:

1. The intervention is repeated each year and the benefits persist over time.

2. The intervention is performed once and the benefits only achieved in that year.

3. The intervention is performed once, but the benefits persist indefinitely.

4. The intervention is performed once and the benefits gradually decrease over 3-years.

There are an infinite number of scenarios that are possible, but these are the most plausible covering the full spectrum of possibilities.

Results

The RCT recruited 1570 Type2 diabetic patients and there were 710 patients recruited in the intervention arm and 860 recruited in the control arm of this study. Figure 1 shows a schematic representation of the study population and sample at baseline and follow up.

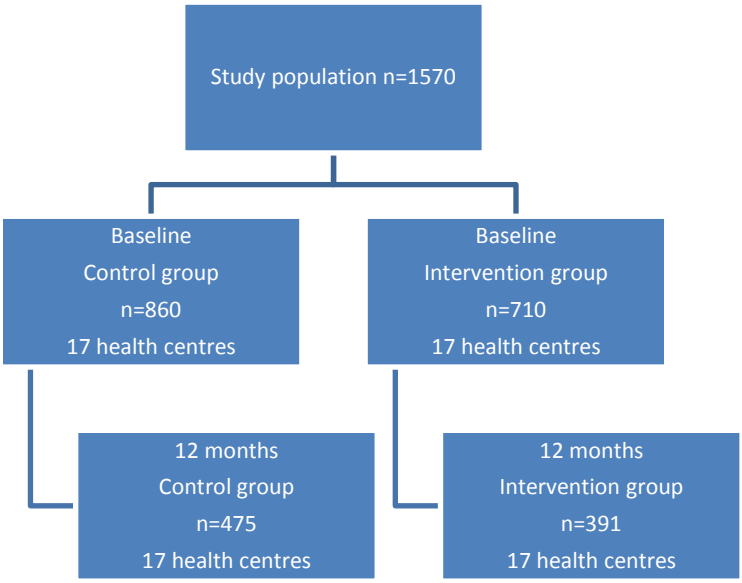

Figure 1: Flowchart of study groups

Table I shows the clinical and biochemical data from the RCT that were collected at baseline. Diabetics were generally poorly controlled with regards to HbA1c, total cholesterol, blood pressure, and waist circumference.

Table I: Clinical and biochemical data collected at baseline (N=1570)

	Control	**Intervention**
Clinical measurements	**Mean (95%CI)**	**Mean (95%CI)**
HbA1c (%)	9.3 (9.2-9.5)	8.9 (8.7-9.1)
HbA1c (mmol/mol)	78 (77-80)	74 (72-76)
Cholesterol (mmol/l)	4.9 (4.8-5.0)	5.0 (4.9-5.1)
Weight (Kg)	83.9 (82.7-85.2)	84.4 (83.0-85.8)
Waist circumference (cm)	100.3 (99.3-101.3)	101.9 (100.9-103.0)
Diastolic blood pressure (mmHg)	85.6 (84.7-86.5)	85.9 (85.1-86.8)
Systolic blood pressure (mmHg)	137.1 (135.4-138.7)	140.2 (138.5-141.8)
Level of control	**n (%)**	**n (%)**
HbA1c < 7% / 53 mmol/mol	134 (15.6)	141 (19.9)
Cholesterol < 5.0 mmol/l	458 (53.3)	342 (48.2)
Diastolic BP < 80 mmHg	289 (33.6)	212 (29.9)
Systolic BP < 130 mmHg	345 (40.1)	245 (34.5)
Waist circumference – Females < 82 cm	40/650 (6.2)	32/508 (6.3)
Waist circumference – Males	80/209 (38.3)	57/202 (28.2)

<94 cm		
Known complications / comorbidity	**n (%)**	**n (%)**
Hypertension	715 (83.1)	539 (75.9)
Hypercholesterolaemia	279 (32.4)	239 (33.7)
Chronic kidney disease	26 (3.0)	12 (1.7)
Cataracts	83 (9.7)	67 (9.4)
Retinopathy	5 (0.6)	40 (5.6)
Peripheral vascular disease	1 (0.1)	13 (1.8)
Leg ulcers	36 (4.2)	24 (3.4)
Neuropathy	12 (1.4)	52 (7.3)
Amputation	7 (0.8)	8 (1.1)
Ischaemic heart disease	26 (3.0)	22 (3.1)
Cardiac failure	35 (4.1)	4 (0.6)
Stroke	26 (3.0)	20 (2.8)
Medication	**n (%)**	**n (%)**
Metformin (mg)	738 (85.8)	595 (83.8)
Glibenclamide (mg)	115 (13.4)	118 (16.6)
Gliclazide (mg)	324 (37.7)	268 (37.7)
Insulin (IU)	228 (26.5)	213 (30.0)
Hydrochlorthiazide (mg)	438 (50.9)	337 (47.5)
Enalapril (mg)	492 (57.2)	420 (59.2)
Amlodipine (mg)	288 (33.5)	276 (38.9)
Simvastatin (mg)	271 (31.5)	258 (36.3)

Table II shows the baseline results from the RCT that describe levels of self-care activities, psychological factors and quality of life.

Table II: Self-care activities, psychological factors and quality of life at baseline (N=1570)

	Control	**Intervention**
Self-care activities	**Mean (CI)**	**Mean (CI)**
Adherence to diet plan (days/week)	4.6 (4.5-4.7)	3.8 (3.7-4.0)
Exercise (days/week)	2.9 (2.8-3.1)	3.4 (3.2-3.5)
Foot care (days/week)	5.4 (5.2-5.5)	4.3 (4.1-4.5)
Adherence to medication (days/week)	6.7 (6.6-6.8)	6.0 (5.9-6.2)
Smoker n (%)	157/860 (18.3)	130/710 (18.3)

Psychological factors		
Self-efficacy score (1-10)	3.4 (3.4-3.5)	3.5 (3.5-3.6)
Internal locus of control score (1-6)	4.7 (4.6-4.8)	4.7 (4.6-4.8)
External locus of control score (1-6)	4.3 (4.2-4.4)	4.2 (4.2-4.3)
Chance locus of control score (1-6)	3.7 (3.6-3.8)	3.4 (3.3-3.5)
Quality of life		
Physical functioning (Score out of 100)	76.7 (75.2-78.3)	74.5 (72.9-76.1)
Role functioning (Score out of 100)	69.9 (67.9-72.0)	77.3 (75.2-79.4)
Social functioning (Score out of 100)	57.9 (55.9-59.8)	64.9 (62.5-67.4)
Mental status (Score out of 100)	59.2 (58.2-60.2)	58.7 (57.6-59.8)
Health status (Score out of 100)	56.3 (55.5-57.1)	56.2 (55.2-57.3)
Pain (Score out of 100)	52.2 (50.3-54.1)	56.9 (54.7-59.0)

Table III shows that none of the primary outcomes were achieved, but there was a significant reduction in blood pressure at 1-year (systolic blood pressure -4.65mmHg (-9.18- -0.12) and diastolic blood pressure -3.3mmHg(-5.35 - -1.26) ,which is likely to be clinically significant. This will have an effect on the reduction of risk for cardiovascular disease.

Table III: Results for primary and secondary outcomes

Outcomes	**Control Mean (CI)**	**Intervention Mean (CI)**	**Difference (intervention – control) (CI)**	**P value**
Self-care activities				
Physical activity score	4.0 (3.8-4.3)	3.9 (3.6-4.1)	-0.25 (-1.13 – 0.63)	0.574
Adherence to diet plan score	4.8 (4.6-5.0)	4.6 (4.4-4.8)	-0.08 (-0.69 – 0.53)	0.802
Adherence to medication score	6.9 (6.8-6.9)	6.8 (6.7-6.9)	0.01 (-0.13 – 0.15)	0.897
Foot care score	5.7 (5.5-5.9)	5.5 (5.3-5.7)	-0.14 (-0.46 – 0.17)	0.380
Smoking (%)	99/483 (20.5%)	78/409 (19.1%)	-0.01 (-0.04 – 0 .03)	0.800
Psychological factors				
Self-efficacy score	3.7 (3.6-3.7)	3.7 (3.6-3.7)	-0.03 (-0.19 – 0.13)	0.735
Internal locus of control score	4.8 (4.7-4.8)	4.8 (4.7-4.8)	0.02 (-0.09 – 0.13)	0.711
External locus of control score	4.5 (4.5-4.6)	4.4 (4.4-4.5)	0.08 (-0.24 – 0.19)	0.283

Chance locus of control score	3.8 (3.7-3.9)	3.6 (3.5-3.7)	-0.18 (-0.56 – 0.19)	0.344
Clinical measurements				
HbA1c (%)	8.8 (8.6-9.0)*	8.4 (8.2-8.6)#	0.01 (-0.27 – 0.28)	0.967
Weight (Kg)	83.5 (81.9-85.2)	83.8 (81.8-85.7)	-1.01 (-3.32 – 1.30)	0.392
Waist circumference (cm)	103.1 (101.9-104.2)	103.6 (102.1-105.1)	-0.72 (-2.4 – 0.94)	0.396
Systolic BP (mmHg)	146.1 (143.9-148.3)	143.1 (140.6-145.5)	-4.65 (-9.18 – -0.12)	0.044
Diastolic BP (mmHg)	88.2 (87.1-89.4)	85.0 (83.8-86.2)	-3.30 (-5.35 - -1.26)	0.002
Total cholesterol (mmol/l)	4.9 (4.8-5.0)	4.8 (4.7-5.0)	-0.13 (-0.27 – 0.01)	0.066
Quality of life measurements				
Physical functioning score	26.9 (26.3-27.4)	26.4 (25.8-27.0)	-0.34 (-1.87- 1.20)	0.668
Role functioning score	79.1 (76.7-81.4)	81.7 (79.2-84.2)	2.05 (-3.95 – 8.05)	0.503
Social functioning score	63.7 (61.0-66.5)	63.2 (60.2-66.2)	-0.34 (-10.89 – 10.21)	0.950
Mental health score	60.2 (59.0-61.4)	60.1 (58.8-61.4)	-0.08(-3.86-3.70)	0.966
General health score	60.0 (59.0-61.0)	58.8 (57.8-59.8)	-1.24(-3.03 – 0.57)	0.179
Pain score	56.0 (53.3-58.7)	57.7 (54.8-60.6)	0.06(-5.96- 6.08)	0.984

Table IV shows a summary of the incremental costs incurred in implementing the educational programme from the perspective of the health services.

Table IV: Summary of the incremental costs

Incremental cost of Group Diabetes Education			
	Per Unit	**Unit**	**Cost:ZAR**
Salary costs			
Health Promotion Officers	42.49	544 hours	23114.56
Training costs			
Health promotion officer	42.49	816 hours	34671.84
Trainer 1 (Family physician/ MI expert)	437.81	48 hours	21014.88
Trainer 2 (Diabetes educator/nurse)	120.7	48 hours	5793.6
Venue hire	0	0	0
Refreshments for training	2300	6	13800
Training manuals	0.3	460 pages	138
Travel costs for training	0.9	2040 km	1836

Education material costs			
Printing Flipchart pages	52.8	17 charts	897.6
Binding of flipcharts	10	17 charts	170
MRC food cards	216.6	17 sets	3682.2
Printing of True/false card packs 15	52.2	17 sets	887.4
Printing costs	0.3	16320 pages	4896
Operational costs			
Venue for education	0	0	0
SMS reminders (Bulk SMS)	0.3	4080 SMS	1224
Patient costs			
Loss of earnings	55	640 patients	35200
Travel costs per patient	9	6120 (3 trips)	55080

Each health promotion officer (HPO) required training to perform the educational sessions. The training course was a total of 8hours per day for 6days and was delivered by an expert in motivational interviewing and a specialist nurse in diabetes, both of whom were involved for the full duration of the training. The training cost for the expert in motivational interviewing was based on a grade 3 specialist salary and for the nurse from the salary for a specialist diabetes nurse educator. No venue costs were incurred for the training as it was performed at the University or the Department of Health premises. Each HPO received a 23 page training manual and cost was calculated at R0.3 per page. The HPOs also had to travel on a daily basis about 10km at R9 by public transport per trip to and from training for 6 days.

The educational materials provided for each of the 17 HPOs for the group sessions were as follows:

- A3 size Flipchart at R52.80 each
- Ring binding of flipcharts at R10 each
- MRC food cards at R216.60 per pack
- Printing of true /false game cards at R52.20 per pack
- There were also printing costs involved for leaflets and information sheets on foot care, goal setting, alcohol use and smoke cessation that were supplied to each HPO for the patients to take home at R0.3 per page.

Each of the HPOs had 4 groups of 15patients each per CHC and had to do 4 group education sessions with each group. The cost calculation assumes that each of the 17 community health centres has its own full time HPO. The group education sessions were each a maximum of 2-hours long. The training and salary cost for the HPOs

were calculated by the number of hours involved and the cost per hour of their time, which was based on the current average salary package for a HPO.

Text messages were used to remind patients when to attend each session at R0.3 per message. Assuming that all of these patients made use of public transport to attend these sessions and that they all lived within a 10km radius ,the cost of transport per visit was estimated at R18. As the educational sessions were held as far as possible on the same day as their routine follow up visits or medication collection dates many of these trips would have been made anyway.

Many of these patients had a half day loss in earning due to them attending the CHC for their chronic disease follow up and for the group education programme. In total therefore for the four educational sessions they would have lost the equivalent of two days of earnings. From the RCT 74% of the sample were female and 26% were male and of these it is estimated that 55% of the working age men and 43% of working age women were employed.[14]Overall therefore 20.4 men and 34.4 women are likely to each have lost the equivalent of 2-days work. Data from the latest census confirms the average monthly income for a working person in the general labour market in the Western Cape is R6400 or R320 per day.[11]Therefore loss of earnings for these patients was R640 per person.

Cost-effectiveness analysis

Table V and Figure 2 shows the number of deaths that should be prevented by implementing the educational intervention using the 4 different scenarios in the cost-effectiveness model. The two scenarios that assume a persistent benefit for the intervention prevent the same number of deaths from CVA and IHD. The scenarios that assume a 1-year or gradually reducing 3-year benefit predict that a much smaller number of deaths would be prevented.

Table V: Number of deaths prevented compared to no intervention

	Annual cost, persistent benefit	1 year cost, persistent benefit	1 year cost, 1 year benefit	1 year cost, 3 year declining benefit
Total CVA	5481	5481	57	374
Total IHD	4215	4215	148	427

CVA=Cerebrovascular accident. IHD=Ischaemic heart disease

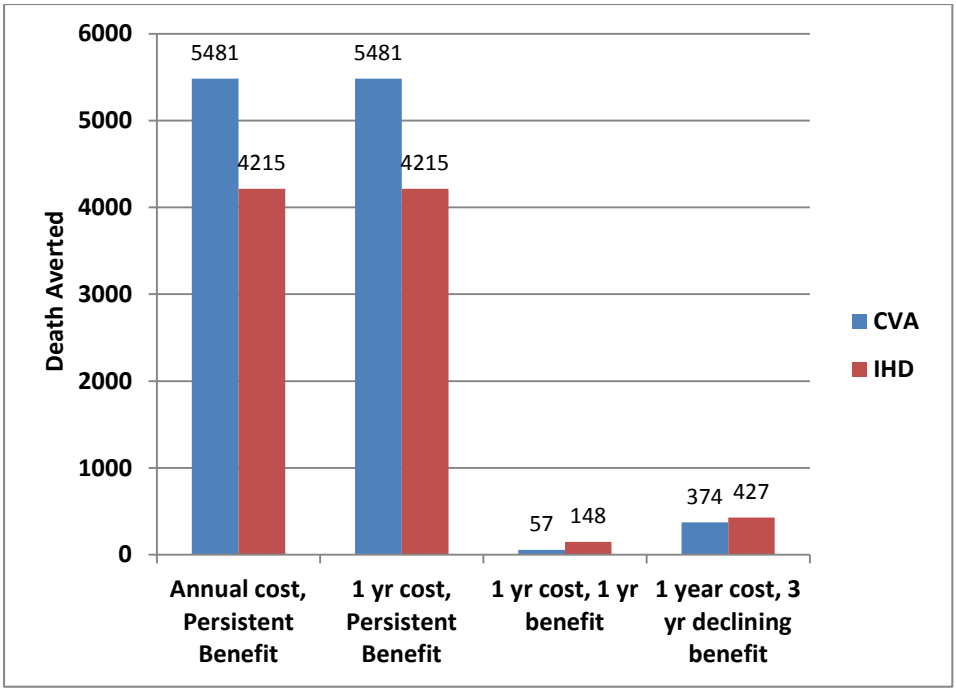

Figure 2: Graphic illustration of number of deaths prevented by performing the intervention in 4 different scenarios taking into consideration how long the benefit will last. CVA=Cerebrovascular accident. IHD=Ischaemic heart disease

Table VI shows the ICER for the 4 different scenarios based on the incremental costs and deaths averted from stroke and ischaemic heart disease.

Table VI: Cost effectiveness of scenarios with different intervention costs and duration of benefits

	Incremental cost ($)	Incremental utility (QALY)	ICER
Annual cost, persistent benefit	125.29	0.0673	1861.66
1 year cost, persistent benefit	-398.49	0.0673	dominant
1 year cost, 1 year benefit	-4.12	0.0044	dominant
1 year cost, 3 year declining benefit	-22.85	0.0095	dominant

Table VI presents an ICER of 1862 $/QALY for the first scenario and finds that the other three scenarios were dominant in the sense that less money would be spent (no incremental costs) to produce a benefit in terms of QALYs. As there were no incremental costs it was not possible to calculate an ICER, although these scenarios

are theoretically superior to the first one. The first scenario, however, is the most realistic as the health services would expect the intervention to be sustained over time if it was implemented.

Discussion

The WHO defines ICER as "very cost-effective" if it is less than 1times the per capita Gross Domestic Product(GDP) or "cost-effective" if it is less than 3 times the per capita GDP. Current GDP per capita for South Africa is 6003.46 United States Dollars(USD).[31,35] The ICER of this educational programme was 1862. This intervention is therefore considered very cost-effective if implemented in South Africa.There is currently no other local data available with regards to the ICER of educational interventions to improve the management of diabetes in South Africa. Systematic reviews, which include studies from other settings, have also found educational interventions in the prevention and management of diabetes and chronic diseases to be cost-effective.[8,9,10,11]The World Health Organisation's (WHO), Global Status Report 2011 on non-communicable diseases (NCD) has classified brief behaviour change counselling interventions or counselling in primary care as a "good buy".

According to a systematic review in the Cochrane Library ,group based education for people with type2 diabetes is effective at improving fasting blood glucose levels, glycated haemoglobin, diabetes knowledge and reducing systolic blood pressure levels, body weight and the requirement for diabetes medication.[15]This RCT in Cape Town only impacted on blood pressure and yet was still found to be cost-effective. It is possible therefore that group education could be more effective in our context, maybe if offered by more qualified professional counsellors, nurses or doctors, although these are a scarce resource in our setting. A qualitative process evaluation of this intervention showed that the health promoters struggled to find suitable space for the group education in the health centres." In many cases space was unsuitable in terms of size or interruptions or was not prioritised by the facility management for this purpose. Health promoters and study co-ordinators also struggled to communicate with patients regarding the dates and times of educational meetings or changes in arrangements. Many patients came from poor communities and had no landline or shared their cell phone with other family members."[12]These factors may have been partly responsible for the poor attendance at the educational sessions and have reduced the effect in the study. Another

possible explanation is that the health promoters, who were less qualified mid-level health workers, were unable to deliver the intervention as effectively.

The University of Stellenbosch, Division of Family Medicine and Primary Care are also in the process of developing an approach to individual brief behaviour change counselling that can be offered by primary care providers such as nurses or doctors.[21]This counselling is supported by patient education leaflets that address the four main risk factors for NCDs: tobacco smoking, unhealthy diet, physical inactivity and harmful alcohol use.[21]Counselling is based on an approach that uses the 5 As (Ask, Alert, Assess, Assist and Arrange) offered again in a guiding style. Other research in our context has suggested that a combination of structured group and ad hoc individual counselling may be the best approach.[2]

Limitations

The results and assumptions of this cost-effectiveness analyses cannot be applied to developed countries. From the data provided by the RCT it lacked data regarding BMI that were not included in the patient data obtained. BMI data had to be extrapolated from other South African studies to be used in the cost-effectiveness model. All the data used in the model is from South Africa and is thus valid for the South African setting. Four assumptions were made about cost-effectiveness through modelling from the intervention are the ones most plausible for the intervention. In cost-effectiveness analyses the assumption of benefit persist if you annually pay for the intervention is the closest to what is being done in the RCT and also the most cost-effective.

Recommendations

Although the RCT on group education in the Cape Town context did not show all the beneficial effects reported in the systematic review the effect on blood pressure alone, if it is sustained, will prevent deaths from stroke and ischaemic heart disease and makes the intervention cost-effective. This study therefore supports the roll out of group based diabetes education in the South African context. Attention should be given to developing similar approaches to the other common NCDs. The Asthma Guideline Implementation Project has developed group education materials for asthma / COPD.[33] Group education should be combined with individual counselling and the whole package implemented in a systematic way, with further health services research, within the primary care health care system.

Conclusion

The start-up and operational costs were calculated for this group diabetes education programme. Despite the initial structured group educational intervention only having an effect on blood pressure, the programme was found to be very cost effective in the South Africa context. Structured group education done by health promoters (mid-level health workers) with a guiding style, for patients with Type2 diabetes mellitus in the public sector primary care facilities of the Western Cape represented value for money. This cost-effectiveness analysis supports the more widespread implementation of this intervention in primary care within South Africa.

Acknowledgements

Prof Tom Gaziano from Harvard University is an expert on cost-effective models for the prevention of chronic disease. He was involved in applying the original data from RCT and incremental cost to a Markov micro-simulation model and calculating ICER.

Ms H Rhode was the project co-ordinator of the initial RCT who was directly responsible for planning, implementation, recruitment and data collection. She helped with regards to data on expenses incurred during the programme.

This project was supported by a BRIDGES Grant from the International Diabetes Federation. BRIDGES, an International Diabetes Federation project, is supported by an educational grant from Lilly Diabetes (ST09-040). Apart from the international funding received from BRIDGES, additional funds were received from the Chronic Diseases Initiative in Africa of which Stellenbosch University is a member and directly from strategic research funds within Stellenbosch University.

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